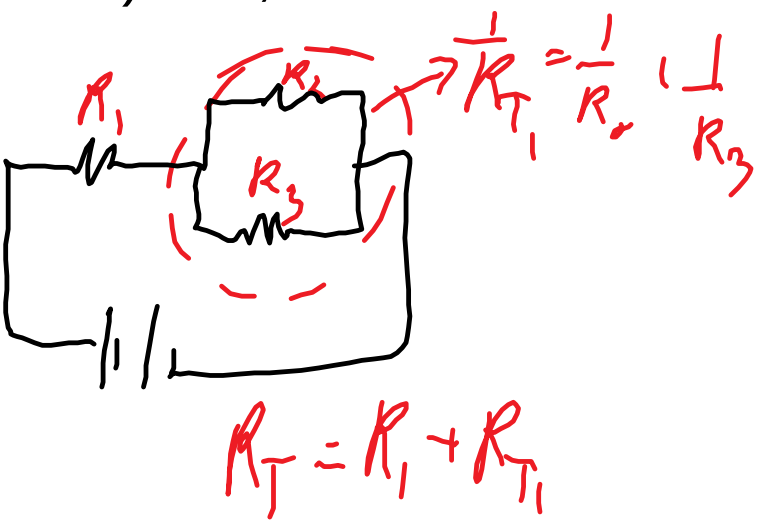
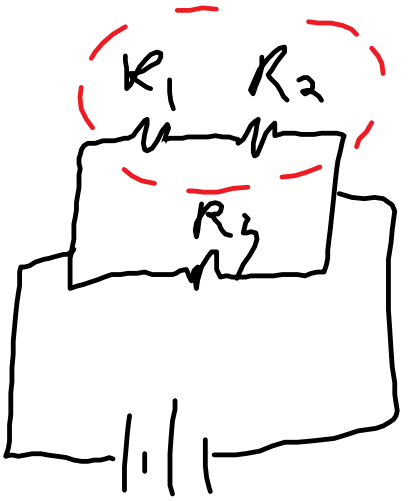
Reminder: Test next Class - Circuits

Big Ideas:

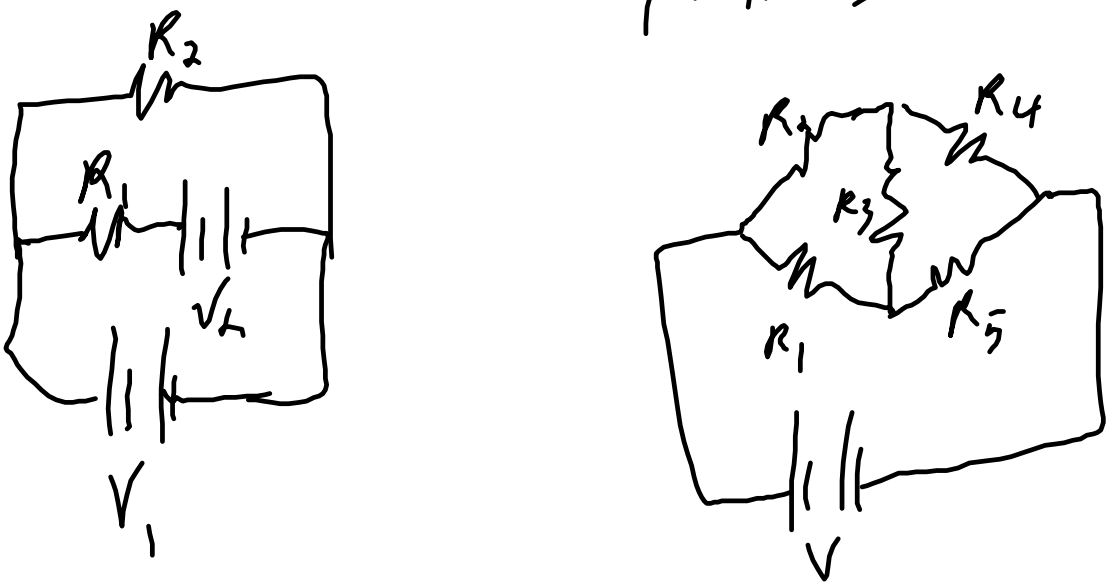
Ohm's Law: $R=V/I$
assume that resistors are ohmic, resistance is constant
units: ohm, $\Omega = V/A$

Resister equations:
Series: Add the resistances, $R_t=R_1+R_2+...$
Parallel: $1/R_t=1/R_1+1/R_2+...$
Mixed: combine resistors that are one type of connection (combine the series or combine the parallel) first, then the other kind.





Can't use resistor equations

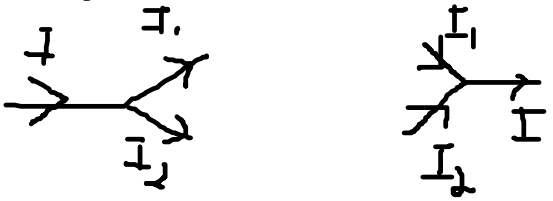


Must use Kirchhoff's Laws

Junction Law - Current Law

current into a junction = current out

$I=I_1+I_2$



Loop Law - Voltage Law

Voltages around a loop add to zero

- voltages in series add up - $V=V_1+V_2$
- voltages in parallel are equal

$P=VI=V^2/R=I^2R$

p502 - GP56-58, 63, 64, 71,72

New rotation tomorrow: 4321

https://www.youtube.com/watch?v=N0sb1SZxCAs

Quiz Solutions:

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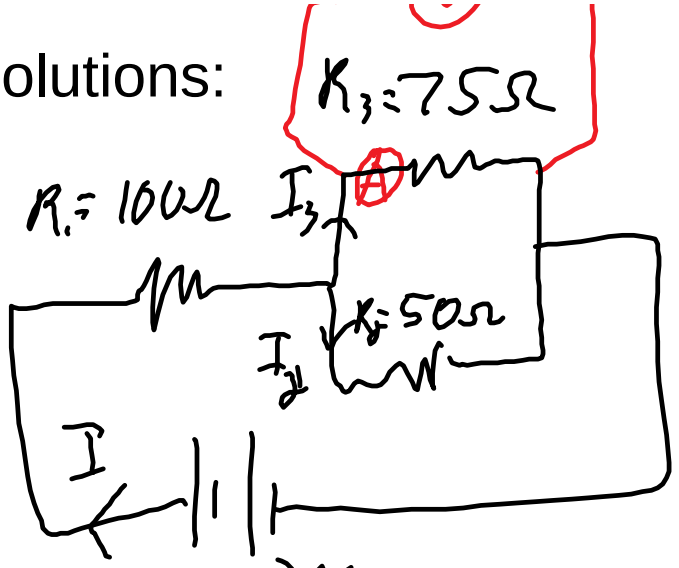


$V = 2V$
$3.5V$
$5.5V$

b) Parallel Portion $\frac{1}{R_{T_1}} = \frac{1}{50} + \frac{1}{75}$

$\frac{1}{R_{T_1}} = \frac{3}{150} + \frac{2}{150} = \frac{5}{150}$

$R_{T_1} = 30\Omega$

Series $R_T = 100\Omega + 30\Omega = \boxed{130\Omega}$

c) $P = VI = \frac{V^2}{R} = I^2R$

$V_T \neq V_1$ $\quad I = \frac{V_T}{R_T} = \frac{2 \text{ or } 3.5 \text{ or } 5.5}{130\Omega}$

$P = \left(\begin{matrix}0.0423\\0.015\end{matrix}\right)^2 100 = \boxed{\begin{matrix}0.18W\\0.024W\end{matrix}}$

$P = \begin{pmatrix} 0.015 \\ 0.069 \end{pmatrix} 100 = \begin{pmatrix} 0.024\,W \\ 0.072\,W \end{pmatrix}$

d) I

$V_1 = R_1 I = 100\Omega\,(I)$

$= \begin{pmatrix} 1.27\,V \\ 0.46\,V \\ 0.81\,V \end{pmatrix}$

loop law $\Rightarrow$ $V_3 = V_{\text{batt}} - V_1 =$

$V = V_1 + V_3$ or V_3

$I_3 = \dfrac{V_3}{R_3} = \begin{pmatrix} 16\,mA \\ 6.1\,mA \\ 11\,mA \end{pmatrix}$

e)

$V_3 = R_3 I_3 = 75\Omega \begin{pmatrix} 12.9\,mA \\ 4.3\,mA \\ 8.6\,mA \end{pmatrix} =$ —

$V_2 = V_3 \quad I_2 = \dfrac{V_2}{R_2}$

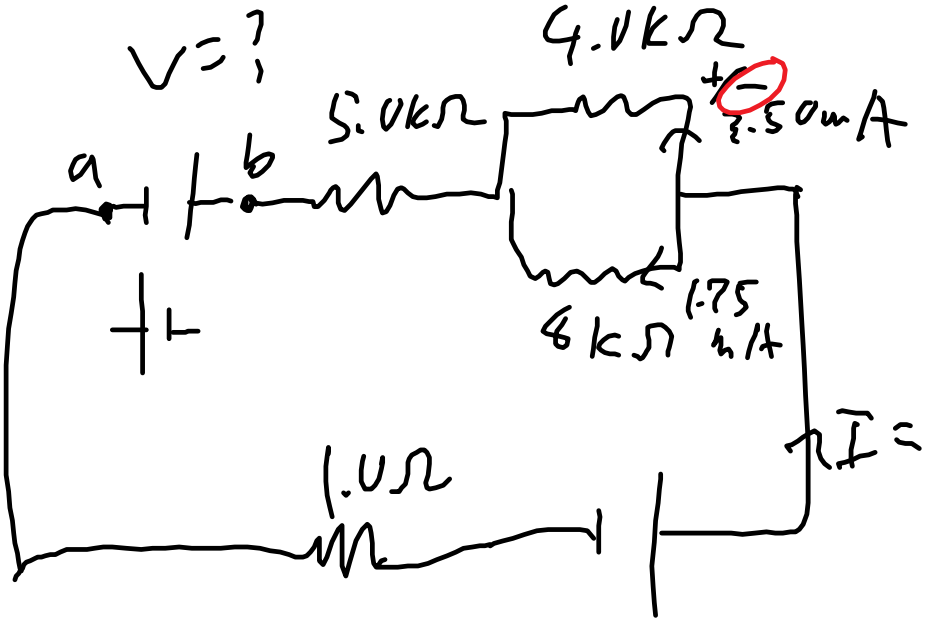
$I = I_2 + I_3$

$V_1 = R_1 I$

$V_T = V_1 + V_3 = \mathcal{E}mf - Ir$

$r = \begin{matrix} 33\Omega \\ 56\Omega \\ 33\Omega \end{matrix}$

Q7 / V=?



$12 - 4\,k\Omega(3.5\,mA) - \frac{5.0}{5}k\Omega \times 5.25mA$

$-V_{ab} - 10 \times 5.25mA = 0$

$12 - 14 - 26.25 - V_{ab} - 0.00525I$

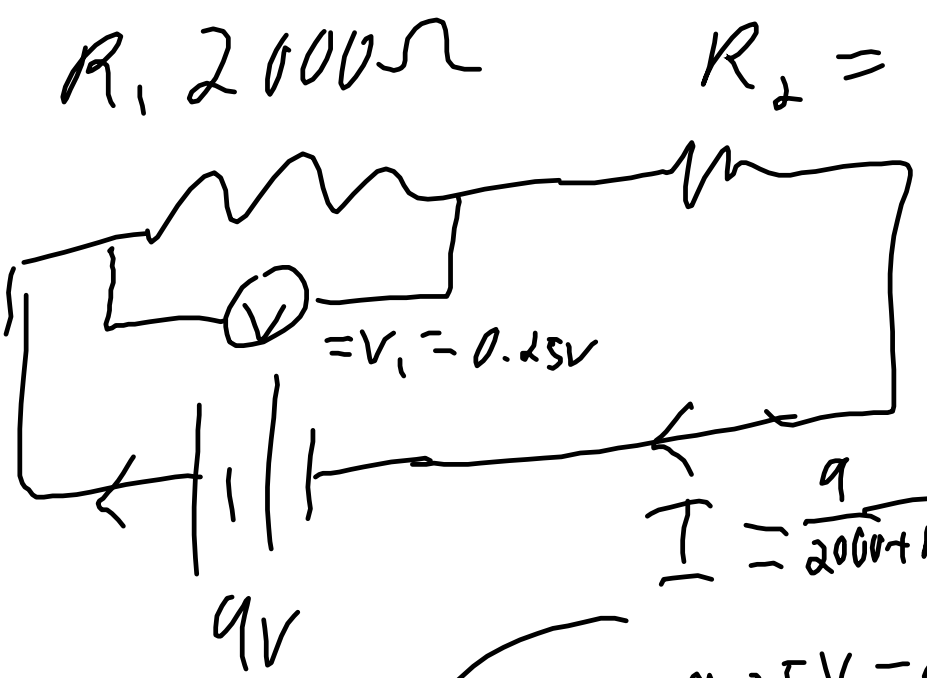
0

$V_{ab} = \underline{28.25525}$

$V_{ab} =$

$14 - 26.25 - V_{ab} - 0.0525$

$V_{44} = 52\,V$

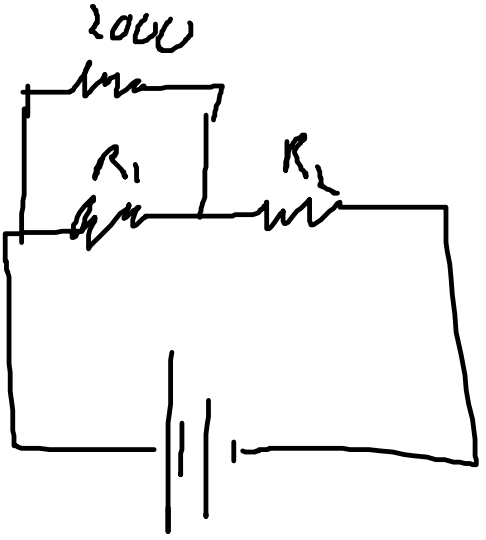


$$I = \frac{9}{2000 + R_2}$$

$$0.25V = 2000\,I$$

$$2000 + R_2 = \frac{9\,(2000)}{0.25}$$

$$R_2 = 74000\,\Omega$$



$$\frac{0.25}{R_1} = 9 - \left(\frac{0.25}{R_1}\right)R_2$$